

# **IMPROVING EMERGENCY MEDICAL DELIVERY IN ARLINGTON, TEXAS**

## **ADVANCED LEADERSHIP ISSUES IN EMERGENCY MEDICAL SERVICES**

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## **ABSTRACT**

The City of Arlington, Texas, has operated a two-tiered EMS system for the last fifteen years. Under this plan, fire apparatus and private ambulances were dispatched to all life threatening calls. Because of the strategic locations of the fire stations, the fire companies would typically arrive first and provide basic life support until the advance life support ambulance would arrive. The problem arose when the private ambulance company did not grow with the expansion of the city. This resulted in long response times for the ambulances and extended on-scene times for fire companies.

The purpose of this research was to identify cost effective methodologies to improve emergency medical services to all of the citizens of Arlington.

The paper used an evaluative and descriptive method to answer the following research questions:

1. How can the emergency medical delivery system be improved for all of the citizens of Arlington?
2. Are paramedic engine companies cost-effective for improving EMS delivery?
3. Should the Arlington, Texas Fire Department pursue a fire-based EMS system?

To answer these questions, literature from the Learning Resource Center of the National Fire Academy and the Arlington, Texas Fire Department was reviewed. Focus groups were conducted with stakeholders from the Arlington Fire Department, The Arlington Emergency Physicians Advisory Board, the private ambulance company, and the City Council EMS committee. The questions used to spur conversation were:

1. What are the strengths of the current EMS system in Arlington?

2. What concerns do you have about the current system?
3. How can the current system be improved?

A survey was also conducted of six major Texas cities.

The results of the focus groups, survey, and literature review revealed that because of contract constraints, the Arlington system was under funded when compared to other cities. Re-negotiating the ambulance contract could fund improvements without having an adverse effect on the city's budget. Additionally, by upgrading the fire department first responder program to an EMT-I level, the citizens could consistently receive A.L.S. care in a time frame that exceeded national standards.

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## INTRODUCTION

The City of Arlington, Texas, established a Fire Department First Responder program in 1984. Under this two-tiered EMS system, fire apparatus and private ambulances were dispatched to all life-threatening medical emergencies. Because of the location of fire stations throughout the city, the Fire Department typically arrived on the scene before an ambulance. The EMTs on the fire apparatus provided basic life support care until the ambulance paramedics arrived. Once the ambulance arrived, the EMTs and paramedics worked together, continuing treatment and preparing the patient for transport.

Rapid growth and service demand have increased the ambulance response times to the outlying southern sections of Arlington. Often, a fire unit would be on the scene in this area for 15 minutes or longer prior to the arrival of a private ambulance. It became obvious that measures needed to be taken to improve timely access for all citizens to advanced life support transport services.

The purpose of this research was to identify cost effective methodologies to improve emergency medical services for all of the citizens of Arlington.

This paper used an evaluative and descriptive methodology. Three research questions were addressed:

1. How can the emergency medical delivery system be improved for all of the citizens of Arlington?
2. Are paramedic engine companies cost-effective for improving EMS delivery?
3. Should the Arlington Fire Department pursue a fire-based EMS system?

## **BACKGROUND AND SIGNIFICANCE**

In 1984, The Arlington, Texas, Fire Department implemented a medical “First Responder” program. The purpose of this program was to provide a quick Basic Life Support (BLS) medical response to care for sick or injured citizens until an Advanced Life Support (ALS) ambulance could arrive. All Fire Department operations personnel below the rank of Battalion Chief were certified to a minimum EMT – Basic level and the department’s nine engines and four truck companies were equipped with the necessary medical equipment.

Advanced Life Support care and transportation were contracted to a local private ambulance company. In return for a substantial subsidy, the ambulance company operated five emergency ambulances on a 24/7 basis. They also provided separate ambulances to accommodate non-emergency transfers. The ambulance company’s performance was monitored by the City Health Department and was based on average response times and customer satisfaction.

In 1987, the City of Arlington rewrote the ambulance contract and sought new bids for service. The responsibility for monitoring the contract was moved from the City Health Department to the Fire Department during this time. The new contract was performance based and required the ambulance company to respond to 90% of all life-threatening emergencies within 8 minutes, 29 seconds. Ninety percent of all non life-threatening emergencies required a maximum response time of 11 minutes, 29 seconds. If the contractor failed to meet these obligations two months in a row, it was deemed to be in breach of the contract and could be penalized by the city.

The contract was awarded to a large east coast company who served the city until 1994, when the nation's second largest private ambulance company purchased it.

Under the new contract, the ambulance provider was no longer required to keep a minimum number of ambulances available. To be cost-effective, the contractor would vary the number and placement of ambulances using a plan called "system status management". Under this plan, the ambulances are assigned based on the analyses of historical service demand, taking into consideration time of year, day of week, time of day, anticipated weather conditions, and other variables. The contract also required that the subsidy be phased out by July 1998, requiring the ambulance company to become financially self-sufficient.

Today, the Arlington Fire Department serves approximately 300,000 people from 16 strategically located fire stations, utilizing 16 engines and 5 truck companies. In addition to their EMT training, all 261 fire personnel are certified to use an automatic external defibrillator (AED), which is carried on each apparatus. Additionally, 35 firefighters have voluntarily increased their certification to a Paramedic level, even though no advance life support equipment is carried on their fire apparatus.

The last four years have seen a dramatic increase in the growth of Arlington. Most of this growth has occurred in the southern part of the city from Interstate 20 to the Arlington-Mansfield city limits. This area accounts for approximately 1/4 of the city's geographic area. Based on anticipated growth, the fire department has proactively constructed fire stations in the new area. Fiscal responsibilities have forced the ambulance company to protect this area from existing ambulance locations. The results have been long response times for the ambulances and extended on scene times for fire companies. This has led to much frustration of firefighters

and ambulance personnel, as well as patients. City Council members became aware of this situation through citizen complaints and requested that the Fire Chief develop a plan to provide equal emergency medical service to all citizens while maintaining a \$0 general fund subsidy.

This research was related to the National Fire Academy's course, "Advanced Leadership Issues in Emergency Medical Services". The subject matter is relevant to unit 2 (Quality Management), unit 3 (Customer Service), and unit 6 (Financial Considerations). It could prove helpful to many other fire departments and private ambulance providers across the country. It addresses a specific problem currently occurring in Arlington, Texas. Other jurisdictions may be confronted with the same or similar problems, and could utilize portions of this report to develop a plan to address their specific situation.

## **LITERATURE REVIEW**

The purpose of this literature review was to examine existing documentation relative to the effectiveness of paramedic engine companies, and determine their viability in Arlington, Texas. Additional literature was reviewed to evaluate whether the fire department should pursue a total fire-based EMS system. Several applied research papers from the Learning Resource Center of the National Fire Academy were reviewed for this project. Numerous magazine articles and interviews with fire service professionals were also utilized to provide additional information to answer the research questions.

In an article for *Firehouse Magazine*, Gary Ludwig states, "One thing is sure about the fire service – we have a variety of methods for delivering emergency medical care." One such method that is increasing in popularity is the Advanced Life Support or paramedic engine



concept. Chief Ludwig also states that “the term ALS or Paramedic engines in some communities has been applied to anything beyond “first-aid” capabilities, all the way up to carrying everything an ALS ambulance would carry except the stretcher.” (Ludwig, 1999, p. 32)

The American Heart Association and the American Medical Association have established a guideline of eight minutes or less for advanced life support to arrive and begin care following a cardiac arrest. Unless ALS arrives within that time, the chance of patient survival is minimal. (Stinnette, 1994)

“Whether for fires or medical emergencies, the only way to ensure a quick and effective response is to have units close to the scene of the event. As many communities have discovered, the way to handle these needs is to upgrade engine companies to ALS paramedic engines”. (Whitehead, 1996, p. 42)

Deputy Chief Gary Morris authored an article entitled, “15 years of Paramedic Engines” in the May 1993 issue of *Fire Chief* magazine. The article describes the positive experiences that the Phoenix, Arizona, Fire Department received as a result of the paramedic engine concept. Chief Morris states, “The advantages far outweigh the disadvantages.” He identified cost as the most significant advantage of the program. If an ALS trained person is added to the fire apparatus, it could save the cost of staffing and equipping an additional medic unit. (Morris, 1993)

Gary Ludwig agrees with Chief Morris and states in an article for *Firehouse Magazine* that, “By upgrading an existing engine company to the Paramedic level, a fire department can eliminate hiring additional personnel, buying another vehicle (ambulance), and the additional

fuel and maintenance cost. The startup cost can easily save a fire department over \$200,000.”

Dennis Rubin reinforces Ludwig and Morris’ findings by identifying how Dothan, Alabama was able to replace three rescue apparatus by using paramedic engine companies. This increased the staffing on the engine companies and reduced the average response time by two minutes. Chief Rubin sums it up by stating, “The real savings come from the proper utilization of personnel. By letting capable, willing paramedics participate in fire duty and the reverse for firefighters answering medical alarms, the city saves a small fortune.”

Another benefit that the Dothan Fire Department realized from the introduction of the paramedic engine concept was department unity. Over the years, two classes of people had evolved, fire medics and suppression men. By insuring that all members were cross-trained to participate with all aspects of the workload, the department unified. (Rubin, 1997, p. 72).

One negative issue that surfaced was the concern that the paramedic engine might miss a fire call because of the large amount of EMS calls. Chief Morris found that less than 1% of the Phoenix Fire Department’s emergency activity resulted from structure fires. He surmised that the likelihood of a fire missed by a first due company because of a medical call was very low. (Morris, May 93).

A similar concern was expressed in Dothan. Some claimed that the fire companies were too busy to take on the additional EMS work. Chief Rubin states that this claim was unfounded because the busiest fire companies in this country are tied up on emergency responses about 10% of the time. He found that Dothan’s responses accounted for approximately 3% to 5% of these times. (Rubin, 1997)

In a report entitled “EMS Systems Evaluations”, Dr. Ed Racht states:

“Although paramedic level care is well known and understood by the public, it is not widely known that only a few of the interventions and treatment methods used by paramedics have been scientifically proven to be highly time critical. Research has confirmed that cardio-pulmonary resuscitation and defibrillation are essential to survival from cardiac arrest. Other clinical treatment procedures in which delays of only a few minutes can adversely affect patient outcomes include: advanced airway management, establishing intravenous access in a critical patient, and the administration of a few medications such as epinephrine for anaphylactic shock. The skills associated with these procedures are relatively easy to teach, practice, and maintain.” (Racht, 1999, p.7)

Dr. Theodore Dellridge makes a similar statement in an article for *Fire Chief* magazine. He states, “Rapid defibrillation for cardiac arrest victims and airway management for some trauma victims remain the only EMS clinical interventions proved to enhance objective patient outcomes.” (Dellridge, 1996, pg. 44) Dr. Racht does not recommend paramedic engines. He states that this concept usually results in a large number of paramedics, each experiencing relatively few patient contacts a year. “Skill degradation is a significant concern in this first response model, since certain skills including clinical judgment, electrocardiogram interpretation, and medical differential diagnosis degrade quickly without frequent practice.” He goes on to say that fortunately, these skills are not as time critical as some of the more easily retained skills. His recommendation is to staff engine companies with firefighters trained to an EMT-Intermediate level. (Racht, 1999, p. 7)

Forty-five percent of the nation’s pre-hospital care is provided by career fire departments, another 17% by volunteer fire departments, and 9% by a third service in which ambulances are

operated by hospitals or municipal health departments. Private ambulance companies provide the remaining 28%. (Bruno, 1997)

In an article for *Fire Chief* magazine, Alfred Whitehead states, “Firefighters continue to be the leading providers of pre-hospital care in the United States.” (Whitehead, 1996 pg. 40). He cites their skills and attitudes as a good fit with the demands of EMS delivery.

Whitehead says that timelines are one of the critical reasons fire personnel are natural providers of EMS. Fire stations are already strategically located throughout the communities. He identifies a 1990 study conducted by the Annals of Emergency Medicine that stated fire-based ALS systems logged an average response time of 5.5 minutes, compared to 7.3 minutes for non-fire-based ALS systems. Whitehead also says that a dual-role fire/medic EMS system not only offers a substantial upgrade, but also can save municipalities money by eliminating the need for duplicating the capabilities of the fire emergency response system through a costly third service or by paying a private contractor that must account for a profit. (Whitehead, 1996)

Carl Goebel advises agencies considering the addition of medical transport that existing personnel and apparatus can be used to produce some of the activities associated with the new service. However, data must be gathered from existing providers, other jurisdictions, or published sources on the likely number and location of transports. The time and resources required for these activities must then be factored into the current agency activity base. Goebel also states,

“The addition of a service, such as EMS transportations, requires personnel, materials, equipment and services that hadn’t been budgeted previously. The initial project cost assessment should be based on conservative assumptions. Every aspect of the new

service should be analyzed to ensure that the new activity won't add unanticipated expenses." (Goebel, 97, p. 40)

Dr. Ed Racht cites the primary obstacles to establishing a fire-based system as cost and risk. He suggests that beginning to provide ambulance service directly through the fire department would involve substantial capital to purchase ambulances and clinical equipment. He estimates the cost of a fully equipped ambulance to be in excess of \$100,000. Additionally, a large number of new personnel would need to be hired. He also says that "risk associated with this model include that of managing a new enterprise in which a city is inexperienced, reimbursement risks during a troubled and turbulent time for healthcare, and the loss of insurance and indemnity protection provided by the private contractor." (Racht, 1999, p. 38)

Dave Huisenga, Director At Large for the IAFCs EMS section, states:

"The right motivation for the consideration of a transport service is critical. A local fire department isn't entitled to provide ambulance service. While transport service may be a logical expansion of a department's duties, if the local ambulance has acceptable response times, is stable financially, has support of the community, and intends to continue its role, it should probably continue providing the service." (Huisenga, 1999, p. 2)

## **PROCEDURES**

The research procedure used in preparing this paper consists of a literature review that was conducted by utilizing numerous periodical articles and several EFO papers from the Learning Resource Center of the National Fire Academy. Additional information was obtained from periodicals located at the Arlington, Texas, Fire Department Training Academy.

Focus group meetings were conducted with personnel from the fire department, private ambulance provider, Emergency Physicians Advisory Board, city manager's office, and the City Council EMS committee. These meetings were held during the month of September 1999, at varying locations. The fire department meetings were held on three consecutive days to ensure that all three work shifts were able to attend. Members of all ranks were invited and a special effort was made to ensure that members of the Arlington Professional Fire Fighters Association Executive Board were included. Any member who was not invited while on duty was welcomed to attend on their off duty day. Two meetings were conducted with the private ambulance provider. One was for field medics and the other was attended by the administrative staff.

Each of the focus groups centered on these questions:

1. What are the strengths of the current EMS system in Arlington?
2. What concerns do you have about the current system?
3. How can the current system be improved?

A telephone survey was also used to gather information from other major Texas cities. The selected cities had a population in excess of 100,000 and varied in their method of EMS delivery. Three of the cities provided EMS service through fire based ambulances, two through

private providers, and one used a third city service. The cities surveyed were Fort Worth, Grand Prairie, Dallas, Houston, Austin, and San Antonio.

The questions asked were:

1. What is the population of your city?
2. How is your service delivered, private provider, fire-based, or third service?
3. What is your annual EMS budget?
4. How much of your annual budget is funded by non-tax revenue?
5. What is the average rate for ALS transports?
6. What is the number of transports per year?

## **RESULTS**

The focus group meetings revealed that all of the stakeholders who participated desired to improve the emergency medical system in Arlington. The City Council E.M.S. committee stated that they wanted to ensure that A.L.S. care was provided equally to all sectors of the City. They did, however, emphasize that they did not want this improvement to have an adverse effect on the general fund. They also did not want to lose local control of the system by becoming part of a regional operation.

The Emergency Physician Advisory Board, headed by the medical director, was very complimentary of all the paramedics, but suggested that joint training between the ambulance company and the fire department be increased. They also stated that equipment such as twelve lead EKGs need to be added to the ambulances. The Board shared the concerns of all the focus groups that current ambulance response times are too long.

Two separate meetings were conducted with the ambulance provider. The first was with the street medics, and the second was with the management of the company. The medics cited long work shifts and lack of staff as key concerns. They also expressed concern that increasing the role of the fire department would be a beginning of an attempt to take over EMS. Management expressed concerns that under the current contract, the maximum average bill that they are allowed to charge is \$342. This is lower than other providers in the area. They also cited a shortage of certified paramedics throughout the state as a problem. With a contract requiring two paramedics per unit, it would be difficult to increase the number of units on the street.

One clear message from the majority of fire personnel was an interest in expanding their medical skill level. There was not universal agreement on what “expanded,” meant. To some, “expanded” meant ALS patient transport, but to others it meant an enhanced certification level of either EMT-I or Paramedic. The major concern of firefighters was the extended response times of the private provider, and the lack of advanced equipment being available to fire department paramedics.

The literature review and data gathered from the focus groups provide information to answer the following questions.

1. **Are paramedic engine companies cost-effective for improving EMS delivery?** The literature review identified several fire departments that are successfully utilizing paramedic engine companies. Cost avoidance was cited as the greatest benefit to adding paramedics to engine companies. By placing a paramedic onto the engine, some departments avoided adding additional rescue units or ambulances. The literature review



also cited skill degradation as a major concern. Skills including clinical judgment, electrocardiogram interpretation, and medical diagnosis were said to degrade quickly without frequent practice. The review indicated that advanced airway management, rapid defibrillation, and intravenous skills are the only EMS clinical interventions proven to enhance patient outcomes. Therefore, some suggest that adding EMT-Intermediate to engine companies could be the most effective solution for some communities.

2. **Should the Arlington Fire Department pursue a fire-based EMS system?** The literature review indicates that a majority of the nation's pre-hospital care is delivered by the fire service. The skills and attitude of firefighters, along with strategically located fire stations are cited as reasons that the fire service is a good choice to provide this service. However, a few authors identified the cost of equipment and personnel, and the management of a new enterprise as concerns a fire department should consider before beginning to provide transport service.
3. **How can the emergency medical delivery system be improved for all of the citizens of Arlington?** All of the focus groups agreed that improvements in the current EMS system are needed, but ideas on what improvements would be the most beneficial varied with each group. A major concern is how to pay for improvements to the system. As a result of comments expressed by the management of the ambulance company, a survey was conducted of six other major Texas cities.

## Rate & Subsidy Comparison to Other Major Texas Cities

	<b>Arlington</b>	<b>Fort Worth</b>	<b>Grand Prairie</b>	<b>Dallas</b>	<b>Houston</b>	<b>Austin</b>	<b>San Antonio</b>
Population	300,000	595,288	115,000	1,047,350	1,800,000	730,000	950,000
Transports	16,411	50,812	5,837	60,000	121,194	44,000	41,523
EMS Budget	5,435,470	13,027,702	1,952,369	19,000,000	33,658,446	16,100,000	30,000,000
Non-Tax Revenue	5,435,470	11,600,680	1,191,239	7,500,000	13,500,000	9,240,000	6,200,000
Tax Subsidy		1,427,022	761,130	11,500,000	20,158,446	6,130,000	23,800,000
Avg. ALS Rate	342	503	450	327	308	398	265
Avg. ALS Collection	331	228	204	125	111	210	149
Cost/Transport	331	256	334	317	278	366	722
Tax Subsidy per Patient		28.08	130.40	191.67	166.33	155.91	573.18
Tax Subsidy per Capita		2.40	6.62	10.98	11.20	9.40	25.05
Zero Subsidy Avg. Bill	342	686	796.89	836.89	750.49	812.26	1,789.81

Table 1

Of the cities surveyed, Arlington is the only city that does not support the ambulance system with a tax subsidy. The results of the survey reveals that the Arlington contract does restrict the amount that a patient can be billed well below that which is charged in other cities. It would appear that re-negotiating the contract to allow the private ambulance provider to charge a rate that is more in alignment with other Texas cities could fund improvements. (See Table 1)

## **DISCUSSION**

The results of the study confirm that the stakeholders associated with the Arlington EMS system would like to see it improved. While some desired the fire department to enter into a fire-based transport system, the literature review identified both positive and negative considerations, before making such a decision. Alfred Whitehead defined the fire service as a good fit to deliver emergency medical transport. He said that firefighters' skills and attitudes as well as the strategic locations of fire stations were benefits that support fire-based EMS. (Whitehead, 1996) Dr. Ed Racht warned fire departments thinking of entering into fire-based EMS that the risk include that of managing a new enterprise in which the department is inexperienced, reimbursement risks during a troubled and turbulent time in health care, and the loss of insurance and indemnity protection provided by the private contractor. (Racht, 1999) Dave Huisenga said, "The right motivation for the consideration of a transport service is critical." For departments using a private ambulance provider, he suggests that if the company is meeting the community's needs, that they continue providing service. (Huisenga, 1999, p. 2) The study identified contract restrictions that prevented the private provider from maintaining service levels equitable to the City's growth. The survey of other major cities validated the private providers charges that the \$342 maximum charge allowed by the contract is substantially lower than other ambulance providers are charging. A re-negotiation of the contract to allow a charge of \$570, which is still below other providers, will provide monies to make numerous improvements to the system.

The single most dramatic and cost effective improvement in emergency response capability of the city's EMS system will be realized by upgrading the fire department first

response program. While some desired to implement a paramedic engine concept, the literature review made very convincing arguments to implement an EMT-Intermediate concept. Dr. Theodore Dellridge identified rapid defibrillation and advanced airway management as the only clinical interventions proved to enhance objective patient outcomes. (Dellridge, 1996) Dr. Ed Racht's comments confirms Dr. Dellridge's findings but adds intravenous access as another critical skill. (Racht, 1999) Since firefighters are already certified to perform rapid defibrillation, they would only need to learn two additional skills.

The improvement to the Arlington EMS system should focus on providing the patient with advanced life support care well within the eight minute twenty-nine second window established by the American Heart Association. This can be accomplished by upgrading firefighter EMTs to an EMT-I level. This improvement will answer the request of the fire department focus group that desired to increase the level EMS certification for firefighters. Some firefighters will be concerned about this mandatory upgrade in certification.

Another improvement can come from placing more ambulances on the street. By increasing the amount that the private provider can collect, they should be able to staff additional ambulances.

## **RECOMMENDATIONS**

After completion of this applied research project, the author feels that the following recommendations should be implemented.

1. Re-negotiate the current contract with the private ambulance provider to include:
  - a) Change the maximum average per carry fee from \$342 to \$570.
  - b) Assign a minimum of one paramedic and one EMT-I to each ambulance instead of the current requirement of two paramedics per unit.
  - c) Place 12 lead electro-cardiology equipment in service on every ALS ambulance.
 

The equipment provided will meet the standards and specifications set by EPAB.

The contractor will deploy this equipment over a minimum period of 24 months, provided that at least one-half of the units are in service during the first 12 months of the contract revision.
  - d) Add to the current performance measure of ninety percent of priority one calls in eight minutes, 29 seconds citywide. Eight percent of Priority one calls in under eight minutes, 29 seconds in each sector of the city.
2. Upgrade all certification levels of firefighters through Battalion Chief from EMT to EMT-I.
3. Equip all fire apparatus with advanced airway and I.V. equipment.

Accomplishment of these recommendations should provide all the citizens of Arlington an improved emergency medical care system that exceeds national standards with no adverse effect on the city's budget.

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